

Claims

- [c1] What is claimed is:
- 1.A method of fabricating a contactless channel write/erase flash memory cell comprising:
- providing a multi-level substrate;
 - forming a tunnel oxide layer on the multi-level substrate;
 - forming a shallow P ion region in said multi-level substrate;
 - forming a floating gate on said multi-level substrate;
 - forming a deep P ion region on one side of said floating gate in said multi-level substrate;
 - forming a first N ion doped region within said deep P ion region and a second N ion doped region on the other side of said floating gate in said multi-level substrate;
 - simultaneously forming a first isolating oxide layer on said first N ion doped region and a second isolating oxide layer on said second N ion doped region;
 - forming a dielectric layer on said floating gate, said first isolating oxide layer and second isolating oxide layer; and
 - forming a control gate over said floating gate over said floating gate.
- [c2] 2.The method of claim 1 wherein said multi-level substrate comprises:
- an N substrate;
 - a deep P well region over said N substrate; and
 - an N well region over said deep P well region.
- [c3] 3.The method of claim 1 further comprising forming at least one bit line metal contact away from any of the N ion doped region and the deep P ion region of the memory cell wherein said metal contact penetrates through said isolating oxide layer and junction between said N ion doped region and said deep P ion region.
- [c4] 4.The method of claim 3 wherein said metal contact further penetrates through said N ion doped region and into said deep P ion region.
- [c5] 5.The method of claim 3 further comprising forming a metal contact to electrically short-circuit the exposed surfaces of said first or second N ion

doped region and said deep P ion region.

[c6] 6.The method of claim 1 wherein said shallow P ion region and said deep P ion region are doped with boron.

[c7] 7.The method of claim 1 wherein said first and second N ion doped regions are doped with phosphorus or arsenic.